Notes Rec. R. Soc. Lond. **46**(2), 317-324 (1992)

THE GENIUS OF MICHAEL FARADAY

by

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Geoffrey Cantor, *Michael Faraday. Sandemanian and scientist. A study of science and religion in the nineteenth century*. Basingstoke and London: Macmillan, 1991. Pp. xi + 359. ISBN 0-333-55077-3.
John Meurig Thomas, *Michael Faraday and the Royal Institution. The genius of man and place*. Bristol, Philadelphia and London: Adam Hilger, 1991. Pp. xii + 234. ISBN 0-7503-0145-7.
The correspondence of Michael Faraday. Volume 1, 1811–1831, edited by Frank A.J.L. James. London: Institution of Electrical Engineers, 1991. Pp. xlix + 673. ISBN 0-86341-248-3.

'Very ordinary background, father ran a smithy, son had virtually no education ... didn't go to university ... But extraordinary - brilliant. The Good Lord's no respecter of backgrounds, never has been, He plants genius the world over and it's up to us to find it'.[1] Spoken neither by a scientist nor by a historian, these were the words by which Prime Minister Margaret Thatcher elevated Faraday to the status of personal hero in 1987. Behind the rhetoric stood the conviction of 1980s Thatcherism, idealizing as it did the cult of the self-made, and challenging the very survival of those weighty institutions of education and science, most notably the universities, which had apparently played no part in the life and work of such great individuals as Michael Faraday and their entrepreneurial counterparts of the Thatcher years.

Historians of science have long recognized the significant processes of political and cultural reconstruction that occur after the death of a celebrated scientist. Such reconstructions, of course, provide fascinating subjects for historical analysis in their own right, informing us more about the reconstructors than the reconstructed. The 20th century has been particularly fond of making and remaking Faraday in its own image. Thus the Smilesian image presented by Margaret Thatcher served a particular political ideology, designed to reawaken the all-too-dormant entrepreneurial and inventive spirit without which the British economy would continue its long retreat from industry and Empire.

A parallel image of Faraday emerges in J.M. Thomas's *Michael Faraday and the Royal Institution*, though for entirely different purposes. Faraday is there presented as 'a humble, self-educated man who conquered and transformed the world'.[2] Though of humble origins and a modest nature, Faraday soon becomes a 'brilliantly successful' scientist of 'towering scientific achievements', a man who 'combined singular gifts of intellectual power, technical virtuosity, intuition and moral perfection'. Canonized, Faraday joins the glorious gallery of scientific saints, a figure, in Ben Jonson's words, 'not of an age, but for all time'.[3] Like Shakespeare in literary culture, Faraday becomes a world-scientist and his local origins act only as a foil against which to portray the immortal genius. Thus might Faraday be said to appear in a kind of 'cosmopolitan limbo, denationalized, almost dehumanized'.[4]

In his foreword to Thomas's book, Sir Brian Pippard highlights some of the principal functions of such a presentation:

> Nowadays ... science has many critics whose views, sometimes ill-founded, command support; and all too often their criticisms pass unanswered, or the answers are lost in the general hubbub. Without determined efforts to explain what they are doing and why it matters, and to show the sort of people they are, there is a danger that science and technology will cease to attract imaginative young people with something of Michael Faraday's dedication and integrity. If that should happen, we shall all be the poorer, for the quality of civilized life has come to depend on science for its very maintenance, let alone improvement.[5]

No wonder, then, that Faraday has long been enlisted by scientific establishments in Britain and throughout the world. With his much-admired lectures at the Royal Institution, his promotion of the famous Friday Evening Discourses and Christmas Lectures, and his modest personality, Faraday provides a role model for the presentation of science to the public. Thus in our own time, when the scientific communities feel under pressure from an apparently uncomprehending public and an unsympathetic government, Faraday serves the cause of science: the ideal scientific genius who not only makes but also communicates discoveries that benefit the world.

Although such uses of Faraday can become the *objects* of historical study, they themselves do not constitute modern historical analysis. No historian today takes seriously the popular assumption that an individual 'genius', scientific or otherwise, could conquer and transform the world. 'No man is an Island, entire of itself; every man is a piece of the Continent, a part of the main', wrote John Donne.[6] Never were his words more applicable than to scientific practice. Recognizing that the notion of 'isolated scientific genius' carries no explanatory power, the modern historian of science will seek on the one hand the resources, assumptions and values that shaped a Faraday's experimental work and scientific writing, and will map on the other hand the paths by which a Faraday achieved the status of 'genius' or 'sage' in the eyes of his own or subsequent generations.

Michael Faraday. Sandemanian and scientist is the product of one such modern historian of science. Cantor is not concerned to use Faraday and his science in support of present-day political causes. He aims instead to dispel the mythologies of popular images of science and the scientist and 'to paint a detailed picture of one particular scientist',[7] both the public *and* the private Faraday. If he has a present-day aim, it is to demonstrate the value of the work of the modern, professional historian of science whose task it is neither to defend nor attack the scientific enterprise but to investigate and explain scientific practice in historical context. Cantor directs his attention to a specific context for Faraday's life, that of the religious group, the Sandemanians, to which Faraday belonged. As a subsidiary aim, however, Cantor admits that he seeks 'to encourage readers to reassess their own views between science and religion'. Yet although Faraday might be said here to be employed as a vehicle for Cantor's views on how we ought to think about the relations between science and religion, his sympathetic treatment of Faraday's religious beliefs is never used to promote a religious cause.

Cantor's scholarly study provides us with a portrait of Faraday quite different from traditional biographies. Faraday's scientific career coincided with a period of dramatic reform in all aspects (political, scientific and religious) of British society. In this period of the Great Reform Bill (1832), strident pleas for the reform of British science were commonplace. Thus Charles Babbage's notorious denunciation of the Royal Society, in his *Reflections on the decline of science in England and on some of its causes*, exploited the perceived achievements of Continental (and especially French) science, with its far greater level of state support, in a campaign for reform of scientific institutions and patronage in Britain. Above all, the launch of the British Association for the Advancement of Science (1831) by an ambitious group of leading British 'Gentlemen of Science' exemplified the reform of science in the 1830s and beyond.[8] Yet Cantor convincingly shows us that Faraday was to a large extent outside these reform movements not only in politics and religion, but also within science itself.

From Cantor's analysis, it becomes evident then that Michael Faraday did not strictly belong within the ranks of these 'Gentlemen of Science' which included William Whewell (master of Trinity College, Cambridge, from 1841), George Biddell Airy (Astronomer Royal from 1835) and Sir Roderick Murchison (Director of the Geological Survey from 1855). As Morrell and Thackray have shown in their now-classic study of the early years of the British Association, these 'Gentlemen of Science', with their moderate politics of reform and liberal Anglican religious values, controlled and shaped science in Britain during this period. In particular, Section A ('mathematics and physics'), with its coterie of élite Cambridge-educated mathematicians, exerted a powerful influence over the less prestigious sections.[9] From mid-century onwards, the younger generation of William Thomson (later Lord Kelvin) and his circle began increasingly to stamp its characteristic style of British mathematical physics upon the British Association, most notably through its articulation and promotion of the new 'science of energy'.[10]

The extent to which Faraday was outside the new scientific establishment is underlined by the way in which the young Cambridge mathematical student William Thomson, engaged in his earliest researches into the mathematical theory of electricity, disdainfully recorded his private view of Faraday's work: in discussion, 'Faraday & Daniell got $(\text{abused})^n$ [abused to the n^{th} power]' and 'I have been very much disgusted with his [Faraday's] way of *speaking* of the phenomena, for his theory can be called nothing else'.[11] Yet it was Thomson who was to do more than anyone else to take up Faraday's electrical researches and reshape them into a form which would provide a major resource for the field theories of electricity and magnetism. Again, as Cantor shows, Faraday's idiosyncratic conception of 'force' distanced him from the new energy doctrines and from concomitant mechanical views of the physical world. Thus Faraday's lack of a Cambridge mathematical pedigree, his non-mechanical approach to natural phenomena, and his own scientific vocabulary all appear to place him outside the leading scientific doctrines of his own time.

In Cantor's account, however, the role of the 'outsider' is neatly reversed. From Faraday's point of view, the political, religious and scientific establishments were the 'outsiders'. For Faraday adhered to a particular form of Protestant Christianity, born from the schisms within Scottish Presbyterianism in the previous century. As he put the point himself: 'I am of a very small and despised sect of Christians, known, if known at all, as *Sandemanians*'.[13] The Sandemanians were indeed a very small religious sect, thinly scattered throughout Great Britain. Drawing a clear line between the spiritual and the mundane, the Sandemanians were 'a society of saints and faithful brethren, so united one to another by the truth [as set forth in the Scriptures] as to be capable of observing all ordinances, duties and discipline which CHRIST hath enjoined them'.[14] It followed that individuals and institutions not professing such articles of faith (most notably the Church of England) were outsiders. In Cantor's words: 'The rest of the world, including both science and Victorian society, was on the outside and did not impinge directly on the proceedings of this small sect.'[14]

Viewed from this perspective, many of Faraday's attitudes and values become far more comprehensible than in orthodox accounts. Thus the manner in which he shunned politics and public affairs becomes explicable not as a result of some lofty view of the apolitical nature of science, but in terms of his deeply personal Christian commitment. Devoted study of the books of the Bible as well as the book of nature, with as little extraneous interpretation and hypothesis as possible, was a duty for the true Christian believer, whereas the pursuit of worldly wealth and ambition was not. Thus whereas Faraday's contemporaries aggressively sought to advance their scientific careers through the British Association, Faraday preferred to remain throughout his life a loyal servant of the Royal Institution, a student of the book of nature and a purveyor of its truths to the interested public. Faraday's 'saintliness' therefore had its roots in religion, although for him the ideal scientific community too should aspire to transcend its mundane concerns and controversies.

An obligation to read in humility the two great books of nature and revelation is perhaps more reminiscent of the 17th century than of the 19th century. In that sense, Faraday appears even less well-adapted to survive in an increasingly competitive, institutionalized and professionalizing Victorian scientific community not noted for its humility. Yet in some respects at least, his values did coincide with those of the 'Gentlemen of Science'. In particular, their gentlemanly disdain for profit ironically coincided with Faraday's similar distaste, though for very different reasons. Concomitantly, they, like Faraday, believed in the importance of using science in the service of the nation and Empire. Thus Faraday's extensive work for Trinity House and the optics of lighthouses complemented researches by the gentlemen of the British Association on tides, meteorology, terrestrial magnetism, ships' magnetism and many other branches of science of importance to the nation.[15]

No more striking contrast emerges, however, than that with William Thomson, for whom science and its application through patented electrical and navigational instruments yielded considerable worldly wealth, a peerage and a burial in Westminster Abbey.[16] It is thus to Lord Kelvin rather than to Faraday that Margaret Thatcher should have looked for the embodiment of Victorian scientific and entrepreneurial values. As Cantor points out in his conclusion, 'Since Faraday's day science has become increasingly utilitarian in the service of both industry and the military ... In these respects Faraday would find present-day science morally unattractive.'[17] More incongruous still, a 1991 Science Museum poster 'Michael Faraday: Father of Electricity', depicting Faraday against a background composed in part of the consumer fruits of electrical industry, must have made the sober Sandemanian look down in anguish.

The idiosyncratic nature of much of Faraday's scientific work raises the question, perhaps even paradox, of why it was apparently so readily accepted, even in his own lifetime. To suggest as an answer that Faraday was 'right', that his greater genius saw further than his contemporaries, is no answer at all. The paths by which Faradayan science (especially electrical science) diffused into the fabric of European (and American) science are particularly complex: not only were prevailing orthodoxies challenged and reworked, but Faraday's own science was much changed in the process. Taking as his text the perceptive insight of Oliver Heaviside in 1895 that '[James Clerk] Maxwell was only 1/2 a Maxwellian', Bruce Hunt has recently shown just how wide can be the gulf between an original scientific work (Maxwell's *Treatise on electricity and magnetism*) and 'standard' scientific versions of it ('Maxwell's equations').[18] Thus it is extremely misleading to credit Faraday or Maxwell with conquests largely brought about by their successors.

What makes possible this kind of historical analysis, of course, is the survival of documents and manuscripts relating not simply to the scientific work, but to the wider contexts in which 19th-century science was practised. In this respect, we are enormously indebted to the painstaking and invaluable work of Frank James who, from the Royal Institution itself, has been preparing the complete correspondence of Faraday. Published by the Institution of Electrical Engineers, the *Correspondence* is now beginning to roll from the presses. On the strengths of the first volume now published, the editor deserves congratulation for a worthy production which will serve scholars of 19th-century science for many decades to come. It is therefore to be hoped that further studies of Faraday, focusing particularly on the ways in which his life and work were reshaped by his contemporaries and successors, will be forthcoming.

Michael Faraday. Sandemanian and scientist is an extremely important contribution to Faraday scholarship. As such, its appearance in the bicentenary year of Faraday's birth was timely. But it is a salutary lesson to anyone who would seek to exploit Faraday for present-day purposes. Cantor's Faraday is most definitely of an age, and not for all time: a gifted individual rooted in the soil of early 19th-century Britain and shaped by the contingencies of time and place. We shall not see his like again.

ACKNOWLEDGMENTS

I thank Ben Marsden and Graeme Gooday for stimulating discussions of the historiographical issues. The latter's paper 'Faraday re-invented: moral imagery and Victorian electrical engineering' was read at the Babbage-Faraday Bicentenary Conference at Cambridge, 5-7 July 1991.

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